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ABSTRACT

This report presents a statistical profile of 57,837 persons representing a national sample from the field of computer science. Data were obtained from the 1978 Survey of Natural and Social Scientists and Engineers sponsored by National Science Foundation and conducted by the Bureau of the Census. Categories considered include: (1) composition; (2) education and training; (3) professional experience and growth of the field; (4) labor force participation; and (5) income. Among the findings reported are those indicating that: about 85 percent of the computer specialists represented in the national sample were male; the median age was 38 years; the overwhelming majority were white (97 percent); computer specialists were more likely to hold a bachelor's than a master's or doctorate degree in 1978; the median number of years of professional experience for the sample was 14 years; in February 1978, 96 percent of the computer specialists were in the labor force; of those not in the labor force, 22 percent were retired; and the median basic salary in February 1978 of the computer specialists employed full-time was $25,867. Supporting documentation (including questionnaire used and information on response rates) is included in appendices. (JN)

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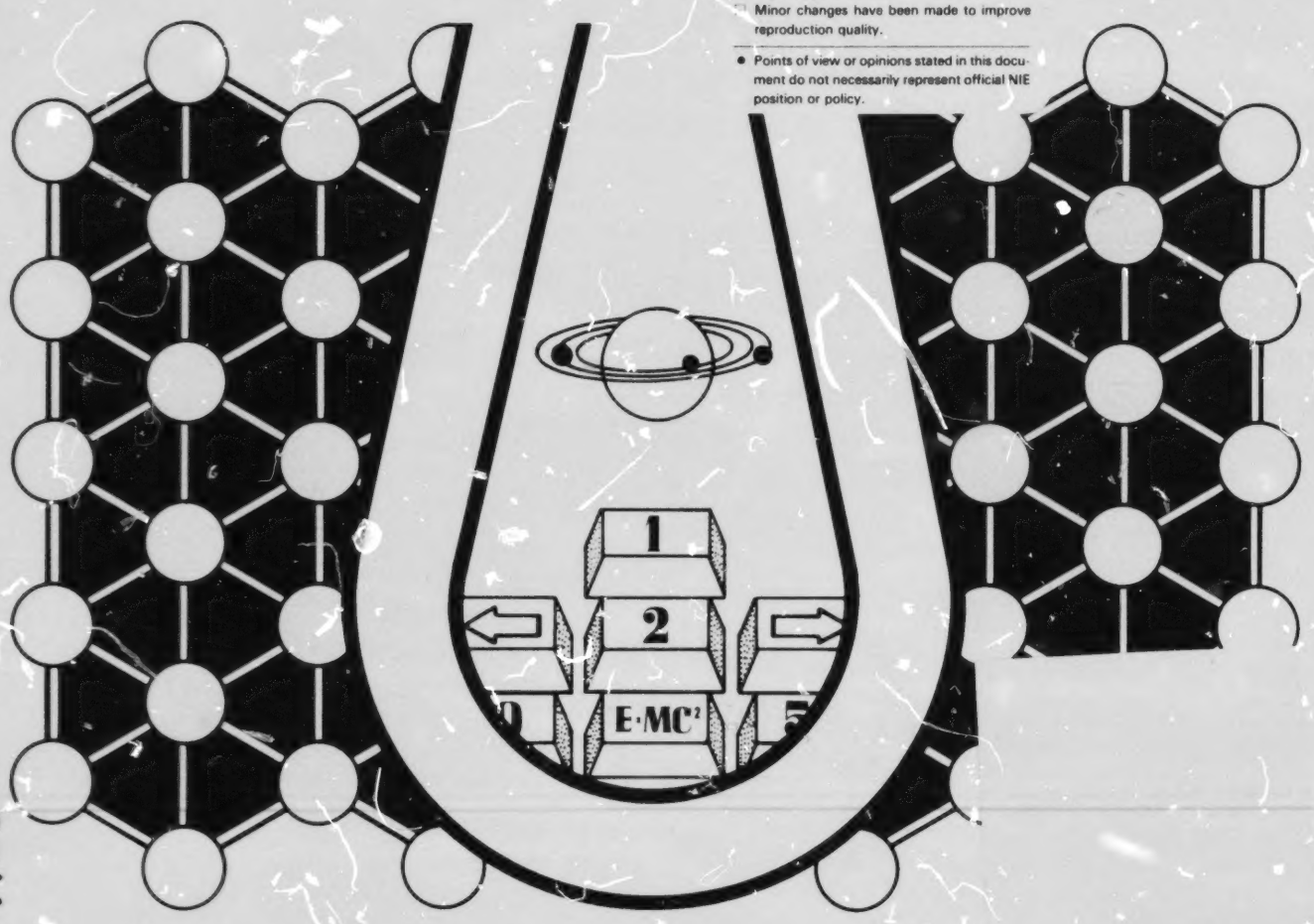

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CURRENT
POPULATION
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Special Studies
Series P-23, No. 134
Issued April 1984

Selected Characteristics of Persons in Computer Specialties: 1978

by
Thomas J. Palumbo

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The principal participants for the National Science Foundation in developing and coordinating the survey were **J. James Brown**, Study Director, Demographic Studies Group, and **Alan Fechter**, Head, Scientific and Technical Personnel Studies Section, both members of the Division of Science Resources Studies. Assistance was provided by **Nancy M. Conlon**, Analyst, Manpower Characteristics Studies Group.

At the Bureau of the Census, **Anita Chiera** and **Jane Ingoid**, both of Labor Force Statistics Branch, Population Division, had primary responsibility in planning and conducting the survey. The systems and processing procedures and programs were developed by **Ann M. Gifford** and **Patricia L. Marks**, of Population Division. Statistical assistance was provided by **Sharon A. Schoch**. Overall direction was provided by **Gordon Green**, Assistant Division Chief (Socioeconomic Statistics Programs), Population Division, and **Paula J. Schneider**, then Chief, Labor Force Statistics Branch, Population Division.

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SYMBOLS USED IN TABLES

–	Represents zero.
X	Not applicable.
Z	Less than 0.05 percent.
*	Based on fewer than 20 sample cases.
27+	The median fell in the category 27 weeks or more.

Related Materials

Statistics from a related survey, the 1972 Professional, Technical, and Scientific Manpower Survey, are found in U.S. Bureau of the Census, Technical Paper No. 33, *Characteristics of Persons in Engineering and Scientific Occupations: 1972,* and U.S. Bureau of the Census, Current Population Reports, Series P-23, No. 45, *Persons in Engineering, Scientific, and Technical Occupations: 1970 and 1972.*

The Census Bureau report based on the results of the 1974 National Survey of Scientists and Engineers is U.S. Bureau of the Census, Current Population Reports, Series P-23, No. 53, *Selected Characteristics of Persons in Fields of Science or Engineering: 1974.* The Census Bureau report based on the 1976 survey is U.S. Bureau of the Census, Current Population Reports, Series P-23, No. 76, *Selected Characteristics of Persons in Fields of Science or Engineering: 1976.* This is the sixth report in a series of reports based on the 1978 survey; the first report in the Series was U.S. Bureau of the Census, Current Population Reports, Series P-23, No. 108, *Selected Characteristics of Persons in Physical Science: 1978.*

For a list of the National Science Foundation reports based on the above-mentioned 1972 and 1974 surveys, see National Science Foundation, *Characteristics of the National Sample of Scientists and Engineers 1974, Part III* (NSF 76-330); and National Science Foundation, *U.S. Scientists and Engineers: 1974* (NSF 76-329). Two National Science Foundation reports based on the results of the 1976 National Survey of Natural and Social Scientists and Engineers are Science Resources Studies Highlights, *National Sample of Scientists and Engineers: Changes in Employment, 1972-1974 and 1974-1976* (NSF 77-322); and *Characteristics of Experienced Scientists and Engineers, 1976* (NSF 78-305). A National Science Foundation report containing results from the 1978 survey, along with other data from the Manpower Characteristics System, is *U.S. Scientists and Engineers 1978* (NSF 90-304).

Selected Characteristics of Persons in Computer Specialties: 1978

INTRODUCTION

The statistics in this report are based on the 1978 survey in a series of biennial surveys known as the National Sample of Scientists and Engineers. The series was sponsored by the National Science Foundation and conducted by the Bureau of the Census. The series began with the 1972 Professional, Technical, and Scientific Survey, with followup surveys of persons from the 1972 survey conducted in 1974, 1976, and 1978. All persons in the national sample were experienced workers, who either had jobs in 1970 or were looking for jobs; new entrants into the labor force since 1970 were not included. Almost all the sample persons were 30 years old and over. In addition, the fields of science and engineering in the national sample were limited to persons who met strict educational, occupational, and professional qualifications. For these reasons, persons in the 1978 National Sample represented approximately 1.5 million scientists and engineers, only a part of the Nation's total scientific and engineering work force (the Department of Labor estimated that, based on occupational qualifications alone, there were 2.4 million scientists and engineers in the United States in 1978).[1]

This report is the sixth in a series of reports based on the 1978 survey. Profiled here are the 57,837 persons represented in the national sample's field of computer specialists.

COMPOSITION (Table 1)

About 85 percent of the computer specialists represented in the national sample were male. The median age in 1978 of the computer specialists in the national sample was 38 years.

The geographical distribution in 1978 of computer specialists was more concentrated in the Northeast and West and less concentrated in North Central and South regions than the general population of the United States 25 years old and over. Around 31 percent of the computer specialists resided in the Northeast, 21 percent in the West, 20 percent in the North Central, and 28 percent in the South.[2] For the general population of the United States 25 years old and over, estimates from the Current Population Survey indicate that, in March 1978, 32 percent of the population resided in the South, 26 percent in the North Central, 18 percent in the West, and 24 percent in the Northeast (figure 1).[3]

The overwhelming majority of computer specialists were White (97 percent). Small percentages of the computer specialists were Asian-American and Black. In addition, only about 1 percent of the computer specialists indicated that their ethnic heritage was Hispanic.

The fields of science or engineering (S/E) in the national sample were much more strictly defined categories than occupations. In general, to be classified into a specific field, a person had to have at least two of the following three characteristics: (1) employment in one of a set of specified occupations, (2) an academic degree among a set of specified academic disciplines, and (3) self-identification within a set of specified professions. Because of these criteria, it was possible for employed persons in each field to be distributed among a spectrum of occupations. Most employed members of the computer specialists group, not surprisingly, were in computer science occupations (97 percent); about 51 percent were employed as computer systems analysts, and 32 percent were involved in other computer fields. Owing to the definition of the computer science field, only about 1 percent of the computer specialists included in this study still remained as computer programmers.

EDUCATION AND TRAINING (Table 2)

Computer specialists were more likely to hold a bachelor's degree than a master's or doctorate degree in 1978. Three-fifths of the group held bachelor's degrees, but fewer than one-third held master's degrees and under 10 percent held doctorates (figure 2).

About 24 percent of the computer specialists held their highest degree in mathematical science, 19 percent majored in business and commerce, and 17 percent in engineering.[4] Only 12 percent majored in computer science and systems analysis.

Supplementary training programs (such as on-the-job training and employer training programs) gave computer

[1] U.S. Department of Labor, Bureau of Labor Statistics, *Employment and Earnings*, Vol. 26, No. 1, January 1979.

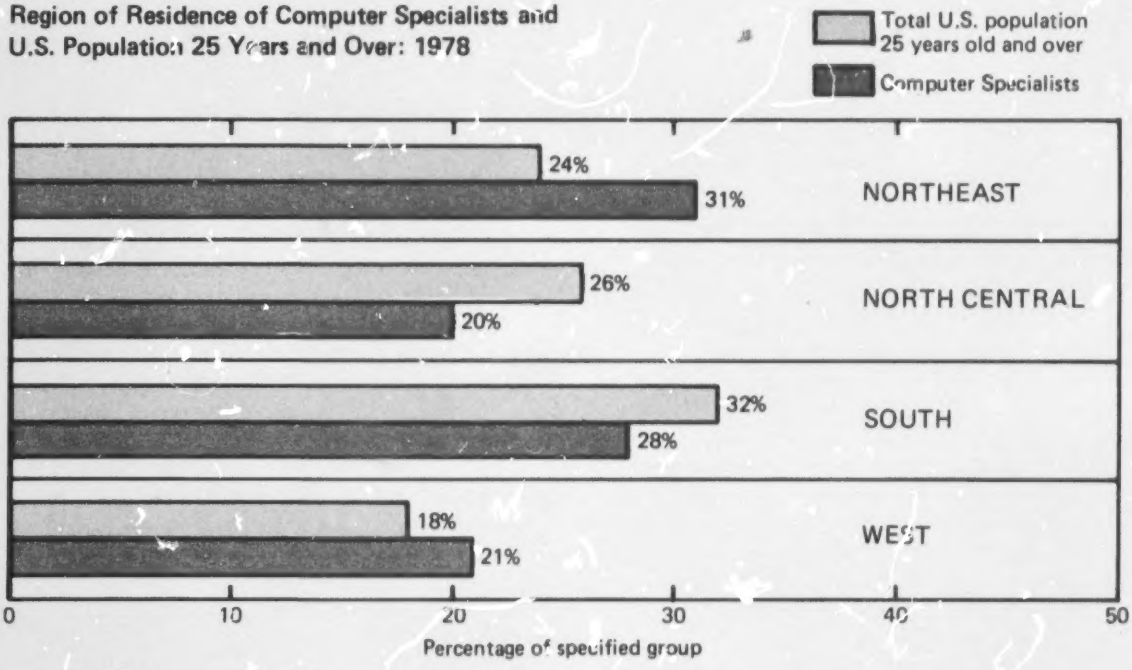
[2] The apparent difference between the 21 percent and 20 percent is not statistically significant; there is some evidence that the 31 percent is statistically significant from 28 percent.

[3] Current Population Reports, Series P-20, No. 331, *Geographical Mobility: March 1975 to March 1978*.

[4] The apparent difference between the 19 percent and 17 percent is not statistically significant.

FIGURE 1.

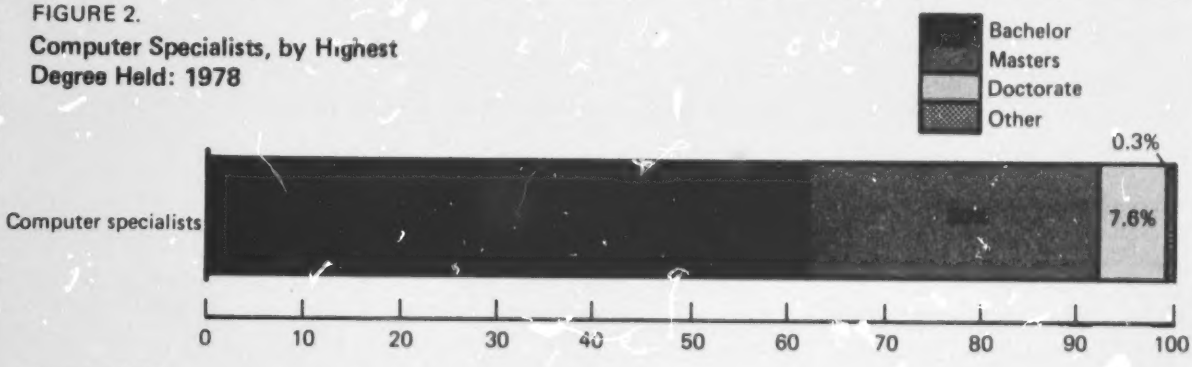
Region of Residence of Computer Specialists and U.S. Population 25 Years and Over: 1978



Source: Table 1 and Current Population Reports, Series P-20, No. 331, Geographical Mobility: March 1975 to March 1978.

FIGURE 2.

Computer Specialists, by Highest Degree Held: 1978



Source: Table 2.

Table A. Field of Science or Engineering in 1978, by Field of Science or Engineering in 1976

(Numbers in thousands)

Field of science or engineering in 1976	Total in national sample in 1978	In field of science or engineering in 1978				Not in S E field in 1978
		Total	Computer specialists	Other S E field		
				Total	Engineer	
Total national sample in 1976	1,350	1,139	58	1,080	722	211
In S E field in 1976	1,119	1,029	47	982	660	90
Computer specialists	57	48	42	6	4	9
Other S E field	1,062	981	5	976	655	81
Engineering	707	660	3	657	649	47
Not in S E field in 1976	173	64	8	56	32	109
Did not report in 1976	57	45	3	42	30	12
PERCENT DISTRIBUTION						
Total national sample in 1976	100.0	100.0	100.0	100.0	100.0	100.0
In S E field in 1976	82.9	90.4	81.5	90.9	91.4	42.6
Computer specialists	4.2	4.2	72.3	0.6	0.6	4.3
Other S E field	78.7	86.2	9.2	90.3	90.7	38.3
Engineering	52.4	58.0	5.8	60.8	90.0	22.3
Not in S E field in 1976	12.8	5.6	13.6	5.2	4.4	51.7
Did not report in 1976	4.2	4.0	4.9	3.9	4.2	5.7
Total national sample in 1976						
In S E field in 1976	100.0	84.3	4.3	80.0	53.5	15.6
Computer specialists	100.0	84.2	73.7	10.5	7.0	15.8
Other S E field	100.0	92.4	0.5	91.9	61.7	7.6
Engineering	100.0	93.4	0.4	92.9	91.8	6.6
Not in S E field in 1976	100.0	37.0	4.6	32.4	18.5	63.0
Did not report in 1976	100.0	78.9	5.3	73.7	52.6	21.1

Source: Table 3 and unpublished data from the 1978 National Sample of Scientists and Engineers.

specialists the opportunity to maintain or improve their academic skills. About 67 percent took advantage of these programs in 1977.[5]

PROFESSIONAL EXPERIENCE AND GROWTH OF THE FIELD (Table 3)

Most of these computer specialists have been involved in professional work, though not necessarily as computer specialists, for a number of years. About 95 percent of the group had more than 5 years of professional experience, 73 percent had over 10 years, and 14 percent had more than 20 years. The median number of years of professional experience for the group was 14 years.

The figures in the lower percent distribution of table A illustrate the interfield mobility between 1976 and 1978 of persons in the national sample. Among persons who were in the computer specialists field in 1976, 74 percent were computer specialists in 1978; almost 11 percent were in other S/E fields, such as engineering (7 percent); and 16 percent were outside S/E fields altogether. The upper percent distribution of table A shows the 1978 fields, particularly computer specialists, in terms of their 1976 components.

About 44 percent of the computer specialists employed in both February 1978 and February 1976 changed jobs[6] during the 2-year period; among these job changers, 51 percent changed their detailed occupation at the time that they changed jobs. Of those employed in February 1978 and January 1974, 61 percent changed jobs during the 4-year period; of these, 56[7] percent changed detailed occupations as well. Finally, of those employed in February 1978 and January 1972, 71 percent had a different job at the end of the 6-year period than at the beginning; of these, 52[8] percent changed detailed occupations (figure 3).

LABOR FORCE PARTICIPATION (Table 4)

In February 1978, 96 percent of the computer specialists were in the labor force. Of those not in the labor force, 22 percent were retired.

The unemployment rate (the number unemployed as a percent of those in the labor force) for computer specialists was

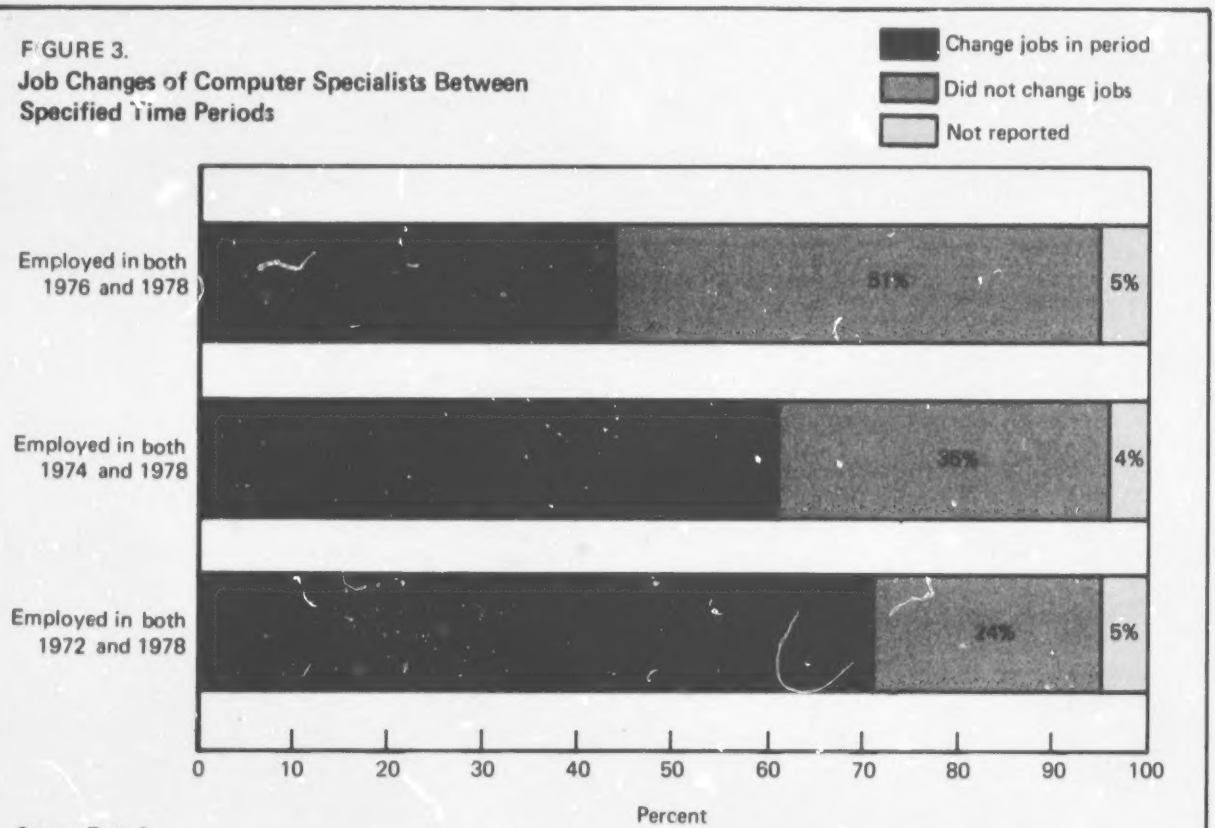
[5] Note that the categories of supplemental training are not mutually exclusive; the same person may have received more than one kind of supplemental training.

[6] That is, changed employers or remained with the same employer, but had a significant change in their duties, level of responsibility, or occupation.

[7] There is some evidence that this 56-percent figure is statistically different from the 51-percent figure in the previous sentence.

[8] There is some evidence that this 52-percent figure is statistically different from the 56-percent figure in the previous statement. However, there is no statistical difference between this 52-percent figure and the 51-percent figure shown above in the first sentence of this paragraph.

FIGURE 3.
Job Changes of Computer Specialists Between Specified Time Periods



Source: Table 3.

about 1 percent in February 1978 (table B). The national unemployment rate of male professional, technical, and kindred workers 25 years and older in February 1978 (not seasonally adjusted) was 1.5 percent.[9]

Table B. Employment Status of Computer Specialists in February 1978

Employment status	Computer specialists	
	Number	Percent
Total in labor force in February 1978.....	55,473	100.0
Employed.....	54,994	99.1
Unemployed.....	479	0.9

Source: Table 4.

Around 3 percent of the computer specialists experienced unemployment in 1977. Unemployed computer specialists spent a median of 7 weeks jobseeking; about 21 percent of the unemployed searched for 27 weeks or more.

[9]U.S. Department of Labor, Bureau of Labor Statistics, unpublished Current Population Survey data.

Almost all of the employed computer specialists (98 percent) worked at fulltime jobs in 1978 (table C).

Almost 96 percent of the computer specialists who worked part-time in February 1978 were not seeking full-time work (table C).

Over 98 percent of the computer specialists employed full-time were working in scientific or engineering positions.

Most employed computer specialists were in three major industry groups in 1978: manufacturing (44 percent), especially of electronic machinery and other computer equipment (24 percent); services, except education and health (15 percent); and public administration (9 percent).

The major types of employers of computer specialists in February 1978 were business or industry (76 percent) and government (12 percent). A notable 7 percent of the employed computer specialists worked for the Federal Government.

Not surprisingly, the largest proportion (41 percent) of the computer specialists reported computer applications as their primary work activity. About 22 percent of the computer specialists were primarily involved in management and administration and about 15 percent in research and development.

The computer specialists in the national sample were asked to choose, from among a list of topics of critical

national interest, the problem to which they devoted the most professional time. About 12 percent selected national defense, 6 percent education, and 5 percent energy and fuel.[10] Over 61 percent of the computer specialists either did not report a national interest topic or indicated that the inquiry was not applicable to them.

The Federal Government supported or sponsored at least some of the work of 28 percent of the employed computer specialists in February 1978. The Department of Defense funded the largest proportion of employed computer specialists (about 15 percent).

Table C. Full- and Part-Time Work Status of Computer Specialists in 1978 Employed in February 1978

Full part-time work status	Computer specialists	
	Number	Percent
Total employed in February 1978.....	54,994	100.0
Full time.....	54,164	98.5
Part time.....	759	1.4
Seeking full-time work.	35	0.1
Not seeking full-time work.....	725	1.3
Seeking not reported...	-	-
Full or part time not reported.....	71	0.1

- Represents zero.

Source: Table 4.

[10]The apparent difference between the 6 percent and 5 percent is not statistically significant.

INCOME (Table 5)

The median basic annual salary in February 1978 of the computer specialists employed full time in February 1978 was $25,867. The median earnings in 1977, as estimated from the CPS,[11] for male professional, technical, and kindred workers, 14 years old and over, who worked year round full time, was $18,224; the comparable figure for women was $11,995. Male year-round full-time workers 25 years old and over with 4 or more years of college (regardless of occupation) had mean earnings in 1977 of $21,441; those with 5 or more years of college had mean earnings of $25,782. It should be noted that the CPS figures are not strictly comparable with those for computer specialists in the national sample.[12]

Results from the 1976 survey of the National Sample of Scientists and Engineers showed a median basic annual salary in February 1976 of computer specialists employed full time in February 1976 of $21,583. Thus, the median basic annual salary of full-time employed computer specialists rose by $4,284 between February 1976 and February 1978. However, when the 1976 and 1978 basic annual salaries are expressed in constant 1977 dollars, the increase is approximately $1,566 or about 3.2 percent per year.[13]

[11]U.S. Department of Commerce, Bureau of the Census, Current Population Reports, *Money Income in 1977 of Families and Persons in the United States*, Series P-60, No. 118.

[12]The CPS concepts "earnings" includes more sources of remuneration than does the National Sample concept of "basic annual salary;" there are also other differences between the National Sample's basic annual salary concept and the CPS earnings concept, including differences in reference periods and data collection procedures. CPS figures for 1977 are cited because 1977 is the full year most nearly comparable with the reference year for the National Sample question on basic annual salary.

[13]The 1976-1978 comparisons in terms of constant 1977 dollars must be approached cautiously. Problems are introduced into the comparisons by, among other things, the way the basic annual salary data are defined and collected, the differences between the nonresponse adjustment procedures of the 1976 and 1978 surveys, and the difficulty of establishing appropriate time periods for the constant dollar computation.

Table 1. Occupation, Professional Identification, and Selected Characteristics of Computer Specialists: 1978

(Detail may not add to total because of rounding. For meaning of symbols, see text)

Occupation, professional identification, and selected characteristics	Computer specialists	
	Number	Percent
Total	57,837	100.0
Male	49,371	85.4
Female	8,466	14.6
Under 30 years	391	0.7
30 to 34 years	15,307	26.5
35 to 39 years	18,968	32.8
40 to 44 years	9,482	16.4
45 to 49 years	7,507	13.0
50 to 54 years	3,559	6.2
55 to 59 years	1,765	3.1
60 to 64 years	641	1.1
65 to 69 years	114	0.2
70 years and over	113	0.2
Median age	38	(X)
RESIDENCE IN 1978		
Total	57,837	100.0
United States	57,454	99.3
Northeast	17,719	30.6
New England	4,882	8.4
Middle Atlantic	12,837	22.2
North Central	11,682	20.2
East North Central	8,147	14.1
West North Central	3,535	6.1
South	15,993	27.7
South Atlantic	9,742	16.8
East South Central	1,897	3.3
West South Central	4,355	7.5
West	12,060	20.9
Mountain	2,251	3.9
Pacific	9,809	17.0
Outlying Areas	22	(Z)
Foreign countries	361	0.6
Not reported	-	-
RACE		
Total	57,837	100.0
White	56,021	96.9
Black	691	1.2
American Indian	33	(Z)
Chinese, Japanese, Korean	984	1.7
All other races	108	0.2
HISPANIC HERITAGE		
Total	57,837	100.0
Hispanic	749	1.3
Not Hispanic	55,717	96.3
Not reported	1,371	2.4
OCCUPATION IN 1978		
Total employed in February 1978	54,994	100.0
Computer specialists, total	53,196	96.7
Computer systems analysts	27,842	50.6
Computer scientists	7,475	13.6
Computer programmers	351	0.6
Other computer fields	17,528	31.9
Engineers, total	134	0.2
Aeronautical and astronautical	-	-
Agricultural	-	-
Chemical	-	-
Civil and architectural	-	-

Occupation, professional identification, and selected characteristics	Computer specialists	
	Number	Percent
OCCUPATION IN 1978		
Electrical and electronic	134	0.2
Industrial	-	-
Mechanical	-	-
Metallurgical and materials	-	-
Mining, petroleum, and geological	-	-
Nuclear	-	-
Environmental and sanitary	-	-
Operations research/systems	-	-
Other engineering fields	-	-
Mathematicians and statisticians, total	64	0.1
Mathematicians	17	(Z)
Statisticians	-	-
Actuaries	-	-
Operations research	47	(Z)
Life scientists	-	-
Agricultural scientists	-	-
Biological scientists	-	-
Biochemists	-	-
Biophysicists	-	-
Medical scientists	-	-
Other life scientists	-	-
Physical scientists, total	-	-
Chemists	-	-
Physicists and astronomers	-	-
Other physical scientists	-	-
Environmental scientists, total	-	-
Earth scientists	-	-
Atmospheric scientists	-	-
Oceanographers	-	-
Psychologists	-	-
Social scientists, total	-	-
Economists	-	-
Sociologists and anthropologists	-	-
Other social scientists	-	-
Health occupations	-	-
Physician or surgeon	-	-
Dental technician	-	-
Medical technician	-	-
Other health occupations	-	-
Technicians and technologists, except medical	-	-
Teachers[1]	-	-
Administrators and managers	1,583	2.9
Other occupations	17	(Z)
Not reported	-	-
PROFESSIONAL IDENTIFICATION IN 1978		
Total	57,837	100.0
Computer specialists	55,476	95.9
Engineers	190	0.3
Mathematicians and statisticians	81	0.1
Life scientists	16	(Z)
Physical scientists	15	(Z)
Environmental scientists	36	(Z)
Psychologists	-	-
Social scientists	17	(Z)
Health occupations	-	-
Technicians, except medical	14	(Z)
Teachers	22	(Z)
Administrators	1,379	2.4
All other occupations	18	(Z)

[1]College or university teachers of science or engineering are excluded from teachers and included in occupation corresponding to subject taught.

Table 2. Selected Educational Characteristics of Computer Specialists: 1978

(Detail may not add to total because of rounding. For meaning of symbols, see text)

Selected educational characteristics	Computer specialists	
	Number	Percent
HIGHEST DEGREE HELD		
Total	57,837	100.0
With a degree	57,837	100.0
Associate	-	-
Bachelor's	35,865	62.0
Master's	17,424	30.1
Doctorate	4,370	7.6
Professional/medical	179	0.3
Other	-	-
No degree	-	-
Not reported	-	-
MAJOR FIELD OF STUDY FOR HIGHEST DEGREE HELD		
Total	57,837	100.0
Computer science and systems analysis	7,195	12.4
Engineering	9,579	16.6
Mathematical sciences	13,806	23.9
Agricultural sciences	172	0.3
Biological sciences	645	1.1
Medical sciences	541	0.9
Chemistry	819	1.4
Physics and astronomy	2,368	4.1
Earth, space, and marine sciences	585	1.0
Psychology	765	1.3
Economics	2,064	3.6
Sociology and anthropology	626	1.1
Other social sciences	1,357	2.3
Business and commerce	11,086	19.2
All other fields	5,417	9.4
All fields below BA	302	0.5
Field not reported	509	0.9
SUPPLEMENTAL TRAINING IN 1977[1]		
Total	57,837	100.0
With supplemental training in 1977	38,605	66.7
On-the-job training	25,224	43.6
Military training applicable to civilian occupations	376	0.7
Extension or correspondence courses	1,981	3.4
Employer training programs	22,049	38.1
Adult education center	3,871	6.7
Other training	10,034	17.3
No supplemental training in 1977	14,823	25.6
Not reported	4,409	7.6

[1]Sum of types of training may exceed total with training because of multiple response.

Table 3. Years of Professional Experience, Field of Science or Engineering in 1976, and Job Mobility of Computer Specialists: 1978

(Detail may not add to total because of rounding. For meaning of symbols, see text)

Professional experience, field in 1976, and job mobility	Computer specialists		Professional experience, field in 1976, and job mobility	Computer specialists	
	Number	Percent		Number	Percent
YEARS OF PROFESSIONAL EXPERIENCE			FIELD OF SCIENCE OR ENGINEERING IN 1976--Continued		
Total	57,837	100.0			
			Psychologists	-	-
With years of professional experience reported	56,780	98.2	Social scientists	338	0.6
Less than 1 year	394	0.7	Economists	141	0.2
1 to 5 years	1,250	2.2	Sociologists and anthropologists	92	0.2
6 to 10 years	13,095	22.6	Other social scientists	105	0.2
11 to 15 years	21,045	36.4	Not in a field in 1976	7,851	13.6
16 to 20 years	12,824	22.2	Did not report in 1976	2,851	4.9
21 to 25 years	4,747	8.2			
26 to 30 years	2,676	4.6	JOB MOBILITY		
31 to 35 years	390	0.7			
36 to 40 years	290	0.5	Total employed in February 1978	54,494	100.0
41 years or more	58	0.1	Employed in February 1976	51,062	92.8
Median years of professional experience	14	(X)	Job changed since 1976	22,506	40.9
Years of professional experience not reported	1,057	1.8	Occupation change	11,534	21.0
			No occupation change	10,819	19.7
FIELD OF SCIENCE OR ENGINEERING IN 1976			Occupation change not reported	153	0.3
			Same job in 1976 and 1978	26,258	47.7
Total	57,837	100.0	Not reported	2,298	4.2
			Not employed or employment status not reported in February 1976	3,933	7.2
Computer specialists	41,815	72.3			
Engineers	3,359	5.8	Employed in January 1974	51,720	94.0
Mathematical specialists	1,125	1.9	Job change between 1974 and 1978	31,505	57.3
Mathematicians	1,083	1.9	Occupation change	17,741	32.3
Statisticians	42	0.1	No occupation change	13,764	25.0
Life scientists	33	0.1	Occupation change not reported	-	-
Agricultural scientists	-	-	Same job in 1974 and 1978	17,930	32.6
Biologists	16	(Z)	Not reported	2,255	4.2
Medical scientists	18	(Z)	Not employed or employment status not reported in February 1974	3,274	6.0
Physical scientists	403	0.7	Employed in 1972	53,196	96.7
Chemists	53	0.1	Job change between 1972 and 1978	37,699	68.6
Physicists and astronomers	315	0.5	Occupation change	19,579	35.6
Other physical scientists	35	0.1	No occupation change	18,120	32.9
Environmental scientists	61	0.1	Occupation change not reported	-	-
Earth scientists	28	(Z)	Same job in 1972 and 1978	12,751	23.2
Atmospheric scientists	33	0.1	Not reported	2,746	5.0
Oceanographers	-	-	Not employed or employment status not reported in 1972	1,798	3.3

Table 4. Employment Status and Selected Job-Related Characteristics of Computer Specialists: 1978

(Detail may not add to total because of rounding. For meaning of symbols, see text)

Employment status and selected job-related characteristics	Computer specialists		Employment status and selected job-related characteristics	Computer specialists	
	Number	Percent		Number	Percent
EMPLOYMENT STATUS IN FEBRUARY 1978			INDUSTRY IN 1978--Continued		
Total	57,837	100.0	Transportation, communications, and other public utilities	2,774	5.0
In labor force	55,473	95.9	Wholesale and retail trade	850	1.5
Employed	54,994	95.1	Finance, insurance, and real estate	4,190	7.6
Full time	54,164	93.6	Educational institutions, total	4,302	7.8
Part time	759	1.3	College or university	3,859	7.0
Seeking full-time work	35	(Z)	Other	443	0.8
Not seeking full time work	725	1.3	Health services	824	1.5
Not reported	-	-	Services except education and health, total	8,406	15.3
Full or part time not reported	71	0.1	Engineering and architectural services	1,400	2.5
Unemployed	479	0.8	Research institutions	2,185	4.0
Not in labor force	2,364	4.1	Other	4,822	8.8
Retired	523	0.9	Public administration	4,718	8.6
Student	83	0.1	Federal	2,288	4.2
Family responsibilities	1,535	2.7	Other	2,157	3.9
Could not find work	-	-	Military	273	0.5
Other	223	0.4	Other industries	3,666	6.7
			Not reported	378	0.7
FULL-TIME EMPLOYMENT IN SCIENCE OR ENGINEERING IN 1978			TYPE OF EMPLOYER IN 1978		
Total employed full time in February 1978	54,164	100.0	Total employed in February 1978	54,994	100.0
In science or engineering	53,386	98.6	Business or industry	41,569	75.6
Not in science or engineering	778	1.4	Educational institutions, total	4,375	8.0
Preferred nonscience or nonengineering	235	0.4	Junior or 2-year college, technical institute	114	0.2
Promoted out of science or engineering	62	0.1	Medical school	152	0.3
Pay better in nonscience or nonengineering	260	0.5	4-year college or university, except medical school	4,016	7.3
Locational preference	20	(Z)	Elementary or secondary school system	92	0.2
Science or engineering position not available	17	(Z)			
Other reason	104	0.2	Hospital or clinic	501	0.9
Reason not reported	80	0.1	Nonprofit organization	1,361	2.5
			U.S. military service/commissioned groups	273	0.5
UNEMPLOYMENT IN CALENDAR YEAR 1977			Government, total	6,417	11.7
Total	57,837	100.0	Federal	3,942	7.2
Unemployed in calendar year 1977	1,995	3.4	State	959	1.7
1 to 4 weeks	793	1.4	Local or other	1,516	2.8
5 to 10 weeks	466	0.8	International agency	106	0.2
11 to 14 weeks	108	0.2	Other	19	(Z)
15 to 26 weeks	174	0.3	Not reported	375	0.7
27 weeks or more	418	0.7			
Median weeks of unemployment	7	(X)	PRIMARY WORK ACTIVITY IN 1978		
Weeks of unemployment not reported	35	(Z)	Total employed in February 1978	54,994	100.0
Not unemployed in calendar year 1977	55,214	95.5	Research and development	8,519	15.5
Not reported	628	1.1	Basic research	283	0.5
			Applied research	1,431	2.6
INDUSTRY IN 1978			Development	5,657	10.3
			Design	1,147	2.1
Total employed in 1978	54,994	100.0	Management or administration, total	11,939	21.7
Agriculture, forestry, and fisheries	114	0.2	Research and development	4,469	8.1
Mining and petroleum extraction	245	0.4	Other	7,470	13.6
Construction	168	0.3	Teaching and training	2,322	4.2
Manufacturing, total	24,359	44.3	Production and inspection	2,247	4.1
Primary metal industries	502	0.9	Quality control	329	0.6
Fabricated metal industries	366	0.7	Operations	1,069	1.9
Machinery, except electrical	661	1.2	Distribution-sales	849	1.5
Electrical machinery equipment and supplies	764	1.4	Consulting	4,013	7.3
Electronic machinery and computing equipment	13,336	24.2	Clinical diagnosis	39	(Z)
Aircraft and aircraft parts	1,500	2.7	Consulting	3,975	7.2
Motor vehicles and motor vehicle equipment	1,002	1.8	Report writing, statistical work, and computer applications	24,110	43.8
Ordnance	853	1.6	Report writing	1,075	2.0
Chemicals and allied products	1,672	3.0	Statistical work	475	0.9
Petroleum refining and related industries	1,209	2.2	Computer applications	22,559	41.0
Other manufacturing	2,521	4.6	Other activities	1,440	2.6
			Not reported	405	0.7

See footnotes at end of table.

Table 4. Employment Status and Selected Job-Related Characteristics of Computer Specialists: 1978—Continued

(Detail may not add to total because of rounding. For meaning of symbols see text)

Employment status and selected job-related characteristics	Computer specialists		Employment status and selected job-related characteristics	Computer specialists	
	Number	Percent		Number	Percent
NATIONAL INTEREST TOPICS[1]			FEDERAL SUPPORT IN 1978[2]--Continued		
Total	57,837	100.0	Department of Defense	8,086	14.7
			Department of Energy	1,577	2.9
Health	2,633	4.6	Department of Health, Education and Welfare	1,814	3.3
Education, total	3,621	6.3			
Teaching	2,624	4.5	Department of Housing and Urban Development	244	0.4
Other	997	1.7			
Environmental protection, pollution control	744	1.3	Department of the Interior	55	0.1
Space	1,421	2.5	Department of Justice	441	0.8
National defense	7,197	12.4	Department of Labor	342	0.6
Crime prevention and control	639	1.1			
Food production and technology	356	0.6	Department of Transportation	1,046	1.9
Energy and fuel	3,020	5.2	Agency for International Development	62	0.1
Other mineral resources	232	0.4	Environmental Protection Agency	413	0.8
Community development and services	650	1.1	NASA	1,867	3.4
Housing	121	0.2	National Science Foundation	849	1.5
Other	1,857	3.2	Nuclear Regulatory Commission	178	0.3
Not applicable	28,695	49.6	Other department or agency	1,175	2.1
Not reported	6,652	11.5	Agency not known	380	0.7
			Agency not reported	113	0.2
FEDERAL SUPPORT IN 1978[2]					
			No Federal support	36,260	65.9
Total employed in February 1978	54,994	100.0			
With Federal support	15,252	27.7	Federal support not known	2,813	5.1
Department of Agriculture	314	0.6			
Department of Commerce	304	0.6	Not reported	670	1.2

[1]Area of national concern in which persons devoted the largest proportion of professional time.
[2]Sum of individual agencies support may exceed total with Federal support because of multiple response.

Table 5. Basic Annual Salary Rate of Full-Time Employed Computer Specialists: 1978

(Detail may not add to total because of rounding. For meaning of symbols, see text)

Salary	Computer specialists		Salary	Computer specialists	
	Number	Percent		Number	Percent
Total employed full time in February 1978	54,164	100.0	With salary[1] reported--Continued		
With salary[1] reported	52,350	96.7	$25,000 to $29,999	15,494	28.6
Less than $8,000	44	(Z)	$30,000 to $39,999	13,154	24.3
$8,000 to $9,999	55	0.1	$40,000 to $49,999	1,130	2.1
$10,000 to $14,999	840	1.6	$50,000 and over	542	1.0
$15,000 to $19,999	5,681	10.5	Median salary (dollars)	$25,867	(X)
$20,000 to $24,999	15,410	28.4	Salary not reported	1,814	3.3

[1]Refers to salary for job held during the week of February 12-18, 1978.

Appendix A. Definitions and Explanations

The 1978 National Survey of Natural and Social Scientists and Engineers was the fourth survey based on the 1970 population of scientists and engineers. It was conducted by the Bureau of the Census for the National Science Foundation. The first survey, the 1972 Professional, Technical, and Scientific Manpower Survey,[1] was conducted among a nationwide sample of approximately 150,000 persons who were recorded in the 1970 Census of Population as being in the experienced civilian labor force in 1 of 63 engineering, scientific, or related occupations. The survey also included a small sample of persons who had completed 4 or more years of college, but were not in any of the specified occupations. Based on responses in the 1972 survey and on criteria established by the National Science Foundation, approximately 50,000 persons from the 1972 survey sample (excluding the small sample of college graduates) were chosen as the sample for the series of longitudinal surveys known as the National Sample of Scientists and Engineers. The 1978 National Survey of Natural and Social Scientists and Engineers was the third survey in this longitudinal series; it was preceded by surveys in 1976 and 1974.[2]

Questionnaires for the 1978 survey were mailed in February 1978. After all data collection activities, 81 percent of the sample (approximately 40,800 persons) completed their questionnaires. The 19 percent who did not complete their questionnaires included persons who refused to participate, the deceased, and persons who returned questionnaires with insufficient information to permit processing. For an analysis of response, see appendix E.

The estimates derived for this survey were prepared by using a ratio estimation procedure and an adjustment for nonresponse in 1978. For each sample case for which a completed questionnaire was obtained, the information from the 1978 survey was matched with the 1972 survey data and the 1970 census data for the same person. Weights applied to samples cases in the 1972 survey were then used to weight the resultant matched data file. The weighting procedure for the 1972 survey involved first the preparation of a preliminary estimate by weighting the results for each sample person by the reciprocal of the probability of selection. As a second step, these weights were adjusted by applying a factor for certain age-sex-race cells within each occupation category. Within each of the cells, the factor was computed as the ratio of the 1970 census count to the preliminary estimate. The final 1972 weight was this factor multiplied by the inverse of the probability of selection for each person. To the extent that the data being tabulated and the estimated count of persons in the cells are positively correlated, the ratio estimate procedure will improve the reliability of the estimate. A discussion of the reliability of the estimates, including a description of the standard errors of totals and percentages, is presented in appendix B.

A nonresponse adjustment was done in 1978 to reduce the bias in the survey estimates due to the high nonresponse rate in 1978. This adjustment was done separately for inscope[3] and out-of-scope[4] persons, and included an adjustment for the mortality in the longitudinal sample from 1972 to 1978. The first step in the nonresponse adjustment was to adjust the nonrespondents for mortality from 1972 to 1978 by means of mortality tables for age-race-sex groups. The second step was to determine the estimated proportion of nonrespondents that were in-scope and out-of-scope. To estimate these proportions, an intensive follow-up was conducted to obtain interviews for a subsample of the 1978 nonrespondents. This follow-up showed that approximately 80 percent of the nonrespondents were in-scope and the remaining 20 percent were out-of-scope. The final step was to determine a nonresponse adjustment factor for different age-race-sex cells. Within each of the cells, the factor was computed as the ratio of the weighted count, using the 1972 weights, of the estimated total (i.e., respondent and nonrespondent) in-scope or out-of-scope persons, divided by the weighted count of the respondent in-scope or out-of-scope persons.

The final weight for the 1978 survey was the product of the 1972 weight and the appropriate 1978 nonresponse adjustment factor.

The definitions for many of the characteristics shown in this report are self-explanatory or can best be understood by referring to the appropriate 1978 questionnaire items or reference lists (appendixes C and D). An explanation of the other subjects is provided below.

Age in 1978. The reference period for age in 1978 was April 1978. The age classification is based on the age of the person at his or her last birthday. The median age is that age that

[1] For a description of the 1972 survey and related matters, see U.S. Bureau of the Census, *Characteristics of Persons in Engineering and Scientific Occupations: 1972*, Technical Paper No. 33, U.S. Government Printing Office, Washington, D.C., 1974.

[2] Results from the 1974 survey were published in U.S. Bureau of the Census, Current Population Reports, Series P-23, No. 53, *Selected Characteristics of Persons in Fields of Science or Engineering: 1974*, U.S. Government Printing Office, Washington, D.C., 1975; results from the 1976 survey were published in U.S. Bureau of the Census, Current Population Reports, Series P-23, No. 76, *Selected Characteristics of Persons in Fields of Science or Engineering: 1976*, U.S. Government Printing Office, Washington, D.C., 1978.

[3] "In-scope" means "in a field of science or engineering."

[4] "Out-of-scope" refers to the category "not in a field of science or engineering."

divides the distribution into two equal parts, one-half being older than the median age and one-half younger. Median ages were divided from an estimation process that distributed the subject populations into 5-year age groups.

Race. The data on race are based on responses in the 1970 Census of Population. The "other races" category includes all races not included in the specific categories listed.

Divisions of the United States. The divisions of the United States comprise the following States:

New England: Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont

Middle Atlantic: New York, New Jersey, Pennsylvania

East North Central: Illinois, Indiana, Michigan, Ohio, Wisconsin.

West North Central: Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, South Dakota.

South Atlantic: Delaware, District of Columbia, Florida, Georgia, Maryland, North Carolina, South Carolina, Virginia, West Virginia.

East South Central: Alabama, Kentucky, Mississippi, Tennessee.

West South Central: Arkansas, Louisiana, Oklahoma, Texas.

Mountain: Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah, Wyoming.

Pacific: Alaska, California, Hawaii, Oregon, Washington.

Outlying areas of the United States include Puerto Rico, Guam, Virgin Islands, American Samoa, and Canal Zone.

Fields of science and engineering. Science or engineering (S/E) fields are categories established by the survey sponsor, the National Science Foundation, to identify persons who could be classified as engineers or scientists under most definitions. In general, to be classified into one of the fields, a person had to have at least two of the following three characteristics: (1) employment in the field, (2) attainment of a specified educational level in an academic discipline related to the field, or (3) self-identification, based upon total education and experience, as being in the field. More detailed information on the criteria for membership in a scientific and technical field is given in U.S. Bureau of the Census, Current Population Reports, Series P-23, No. 76, *Selected Characteristics of Persons in Fields of Science or Engineering: 1976,* U.S. Government Printing Office, Washington, D.C., 1978.

Highest degree held. Highest degree held in 1978 refers to the highest academic degree awarded to the respondent in 1978 or earlier. Data on highest degree held were derived as follows: The level and the year of award of the highest degree received by the respondent between January 1972 and 1978 surveys (this degree will be referred to as degree "A") were compared with the level and year of award, determined from the 1976, 1974, and 1972 surveys, of the previously-designated highest degree held by the respondent (this is referred to as degree "B"). If degree A was at the same level or at a higher level than degree B, and if its date of award was later than that of degree B, degree A was designated as the highest degree held in 1978; otherwise, degree B was designated as the highest degree held in 1978.

The "other degree" category includes persons whose highest academic degree was one of the following: RN, LLB, MD, and academic degrees other than those shown in the tables.

Major field of study for highest degree held. The data on major field of study refer to the major subject associated with the highest degree held in 1978 determined by the method described above. For persons who received their highest degree held in 1978 after January 1972, the data are derived from question 3 of the 1978 questionnaire (see appendix C), or question 1, part b of the 1976 questionnaire or from question 2, part b5 of the 1974 questionnaire. For persons who received their highest degree in 1971 or earlier, the data on major subject are based on the 1972 survey.

Employment status. Employed persons are those who reported that they were employed, either full time or part time, on vacation, or otherwise temporarily absent from a job for health or personal reasons during the reference week (February 12-18, 1978). The unemployed are persons who marked the "unemployed and seeking work" category (box 3) of item 5a of the 1978 questionnaire (see appendix C), or who indicated in item 7 that they were on layoff from a job. All other persons were classified as "not in the labor force."

Unemployment in 1977. The data on unemployment in 1977 relate to the occurrence of unemployment during the entire calendar year rather than just during a reference week. Medians are based on the intervals shown in the tables.

Primary work activity in 1978. The data on primary work activity in 1978 were derived, in general, from answers to question 11b of the 1978 questionnaire. In certain instances of nonresponse to question 11b, however, the data were derived from an imputation procedure that used responses to question 11a.

Type of employer. The data on type of employer in 1978 are based entirely on responses to question 12 of the 1978 questionnaire.

Basic annual salary rate. The statistics on salary refer to the basic annual salary associated with the job held in February 1978. The figures relate to salary before deductions for income tax, Social Security, retirement, etc., but do not include bonuses, overtime pay, or earnings from secondary

jobs. For employees of educational institutions whose salary was for 9 or 10 months, the salary rate was adjusted to a 12-month basis. Median salaries were derived by an estimation process that distributed the subject population into $1,000 intervals.

Job and occupational mobility in 1976 and 1978. The data on mobility between 1976 and 1978 were derived from answers on both the 1976 and 1978 questionnaires. Persons were classified as with a "job change between 1976 and 1978" if they were employed in both 1976 and 1978 and reported in the 1978 survey that their current job began in 1976 or later. Persons were classified as "same job in 1976 and 1978" if the beginning date of their most recent job was in 1975 or earlier, and as "not reported" if they did not report the beginning date of the most recent job. For persons with a job change, the detailed occupation of the 1978 job was compared with that of the 1976 job, and persons were classified as with the same or a different occupation or as "occupation change not reported."

Job and occupational mobility in 1974 and 1978 and in 1972 and 1978. The data on mobility between 1974 and 1978 and between 1972 and 1978 were derived from answers on the 1974 and 1978 questionnaires and 1972 and 1978 questionnaires, respectively. The procedure was analogous to that described for the data on job and occupational mobility in 1976 and 1978.

Years of professional experience. Median years of professional experience are based on 1 year intervals.

Symbols. A dash (—) represents zero, and "X" means "not applicable." The symbol "Z" means less than 0.05 percent. The symbol "*" means based on fewer than 20 sample cases. For the characteristic "Unemployment in Calendar Year 1977," the symbol "27+" means that the median fell in the category "27 weeks or more."

Appendix B. Reliability of the Estimates and Standard Errors of Totals and Percentages

There are two types of possible errors associated with estimates based on data from a sample survey: sampling and nonsampling. The following is a description of the sampling and nonsampling errors associated with the 1978 Survey of Scientists and Engineers.

SAMPLING ERRORS

The particular sample used for this survey is one of a large number of possible samples of the same size that could have been selected using the same sample design. Even if the same schedules and instructions were used, estimates from each of the different samples would differ from each other. The deviation of a sample estimate from the average of all possible samples is defined as the sampling error. The standard error of a survey estimate attempts to provide a measure of this variation among the estimates from the possible samples, and thus, is a measure of the precision with which an estimate from the sample approximates the average result of all possible samples.

As calculated for this survey, the standard error also partially measures the variation in the estimates due to response errors (nonsampling errors), but it does not measure, as such, any systematic biases in the data. Therefore, the accuracy of the estimates depends on both the sampling and nonsampling errors, measured by the standard error, and biases (and some additional nonsampling errors not measured by the standard error.

The figures presented in the tables B-1 and B-2 are approximations to the standard errors of the various estimates for this survey. A number of approximations and generalizations have been used so that the standard errors would be applicable to a wide variety of characteristics and still be prepared at a moderate cost. Thus, the standard errors in the following tables provide an indication of the order of magnitude, rather than precise measurements of the standard errors.

Standard errors on totals. Table B-1 presents the standard errors applicable to estimated totals for characteristics of computer specialists. Linear interpolation can be used to determine standard errors for estimated totals not specifically shown in table B-1. In addition, standard errors for estimated numbers not shown in these tables may also be computed directly from the following standard error formula:

$$\text{standard error of } x = \sqrt{ax^2 + bx}$$

The "a" and "b" parameters for the computer science group are—

Field	"a" parameter	"b" parameter
Computer specialists, Total	.000113	41.9

For example, there are an estimated 523 computer specialists, total, who were retired in 1978. The above table shows that a = .000113 and b = 41.9 for computer specialists, total. Thus, the estimated standard error of 523 is

$$\sqrt{(.000113)\,(523)^2 + (41.9)\,(523)} = 148.137$$

Table B-1. Standard Errors of Totals

(68 chances out of 100)

Size of estimate	Computer specialists
100	60
200	90
500	140
700	170
1,000	200
2,500	320
5,000	460
10,000	660
25,000	1,090
50,000	1,670
75,000	1,940

Standard errors on percentages. The reliability of an estimated percentage, computed by using sample data for both the numerator and the denominator, depends upon both the size of the percentage and the size of the total upon which the percentage is based. Estimated percentages are relatively more reliable than the corresponding estimates of the numerators of the percentage, particularly if the percentages are 50 percent or more.

Table B-2 presents the standard errors of estimated percentages for computer specialists, total. Two-way linear interpolation can be used to determine standard errors for estimated percentages not specifically shown in table B-2. In addition, the standard errors for percentages not shown

in these tables can also be computed directly from the following formula:[1] standard error of the percentage p on a base of $y = \sqrt{(p)\ (100-p)\ \frac{b}{y}}$

For example, an estimated 1.3 percent of the 57,837 computer specialists, worked part-time in 1978. The above table shows that b = 41.9 for computer specialists. Thus, the standard error for the 1.3 percent on a base of 57,837 is

$$\sqrt{\frac{(1.3)\ (100-1.3)\ (41.9)}{57,837}} = .30 \text{ percent}$$

Standard error intervals. The sample estimate and its estimated standard error enable one to construct interval estimates that include the average result of all possible samples with a known probability. For example, if all possible samples were selected, each of these surveyed under identical conditions and an estimate and its estimated standard error were calculated from each sample, then—

1. Approximately 68 percent of the intervals from one standard error below the estimate to one standard error above the estimate would include the average result of all possible samples;

2. Approximately 90 percent of the intervals from 1.6 standard errors below the estimate to 1.6 standard errors above the estimate would include the average result of all possible samples;

3. Approximately 95 percent of the intervals from two standard errors below the estimate to two standard errors above the estimate would include the average result of all possible samples.

The average result of all possible samples either is or is not contained in any particular computed interval. However, for a particular sample one can say with specified confidence that the average result of all possible samples is included within the constructed interval.

For example, of the 57,837 computer specialists, in 1978, 30.1 percent have the master's degree a the highest degree held in 1978. The standard error of this percent as computed from table B-2 is 1.2 percentage points. Based on these data, we may conclude that the percentage of computer specialists with the Master's Degree as the highest degree held in 1978 lies between 27.7 percent and 32.5 percent with 95 percent confidence, i.e., within 2 standard errors.

Standard errors of differences between estimates. The figures in these tables are not directly applicable to standard errors of differences between two sample estimates. The standard error of the estimated difference between two figures may be approximated by the square root of the sum of the squares of the standard error of each estimate. This approximation will yield an exact result when the two characteristics are uncorrelated. If the two characteristics are positively (negatively) correlated, the approximation will overestimate (underestimate) the standard error of the difference. For a difference between two sample estimates, one of which represents a subclass of the other, the table can be used with the difference considered as the sample estimate.

For example, of the 57,837 computer specialists, in 1978, 62.0 percent have the bachelor's as the highest degree in 1978. The standard error of this percent as computed from table B-2 is 1.3 percentage points. The standard error of the difference between the percentage of those with bachelor's degrees and the percentage of those with master's degrees (i.e. 62.0-30.1 = 31.9 percent) is then approximately

$$\sqrt{(1.3)^2 + (1.2)^2} = 1.77 \text{ percentage points}$$

Based on these data, we may conclude with 95 percent confidence that the average estimate of the difference of the percentages derived from all possible samples lies within the interval 28.4 percentage points to 35.4 percentage points.

Standard errors of medians. The figures in these tables are not directly applicable to standard errors of estimated medians. The sampling variability of an estimated median depends upon the size of the base as well as on the distribution from which the median is determined. An approximate method for measuring the reliability of a median is to determine an interval about the estimated median, such that there is a stated degree of confidence that the median based on all possible samples lies within the interval. The following procedure may be used to estimate confidence limits of a median based on a sample data:

1. Determine the standard error of a 50 percent characteristic from the approximate standard error table (table B-2) using the appropriate base;

2. Add this standard error to 50 percent to obtain an upper boundary percentage and subtract this standard error from 50 percent to obtain a lower boundary percentage;

3. Using the cumulative distribution from which the median median is derived, read off the numbers corresponding to the boundary percentages. The interval between these two numbers (i.e., the confidence limits) will be the 68-percent confidence interval. A 95-percent confidence interval may be determined by finding the values corresponding to 50 percent plus or minus twice the standard error in step (1).

[1]The tables for the standard errors of percentages for most scientific and engineering fields (SEF's) were combined. The tables of standard errors given for such collapsed groups are always conservative, i.e., the table for the SEF with the largest standard errors was chosen to represent all the SEF's in the group. Because of this, the standard errors calculated directly from the formula may differ slightly from those found in the tables.

For example, the data for 1978 indicate that the estimate of the median age for computer specialists is 38.5 years. The distribution of computer specialists by age is shown in the table below:

Age (Years)	Percentage	Cumulative Distribution
Under 30	0.7	0.7
30 to 34	26.5	27.1
35 to 39	32.8	59.9
40 to 44	16.4	76.3
45 to 49	13.0	89.3
50 to 54	6.2	95.4
55 to 59	3.1	98.5
60 to 64	1.1	99.6
65 to 69	0.2	99.8
70 and over	0.2	100.0

From standard error table B-2, the standard error of a 50 percent characteristic with a base of 57,837 is 1.3 percentage points. From the table of cumulative age distribution, the percentage point that corresponds to 35 years is 27.1 percent and to 40 years is 59.9 percent. The lower confidence limit corresponding to 48.7 percent (50 percent minus 1.3 percent) is found by linear interpolation between 35 years and 40 years to be 38.3 years, i.e.,

$$35 + [(40-35)\left(\frac{48.7-27.1}{59.9-27.1}\right)] = 38.3$$

Similarly, the upper confidence limit corresponding to 51.3 percent (50 percent plus 1.3 percent) is found to be 38.7 years:

$$35 + [(40-35)\left(\frac{51.3-27.1}{59.9-27.1}\right)] = 38.7$$

Consequently the 68-percent confidence interval, as shown by the data, is from 38.3 years to 38.7 years. Likewise, we could conclude that the 95-percent confidence interval is from 38.1 years (the distribution point corresponding to 47.4 percent) to 38.9 years (corresponding to 52.6 percent).

NONSAMPLING ERRORS

In general, nonsampling errors can be attributed to many sources: Inability to obtain information about all cases, definitional difficulties, differences in the interpretation of questions, inability or unwillingness to provide correct information on the part of the respondents, mistakes in recording or coding the data, and other errors of collection, response, processing, coverage, and estimation for missing data. As the above list indicates nonsampling errors are not unique to sample surveys, since they can, and do, occur in complete censuses as well.

The primary source of nonsampling error in the 1978 National Sample survey is probably the high nonresponse rate. An adjustment in the estimation procedure for the 23 percent noninterview rate in the 1972 survey and the additional 19 percent nonresponse rate in 1978 was made, but there still remains some unknown bias in the estimate due to differences in the characteristics of those who were interviewed in 1978 and those who were not.

It should also be pointed out that estimates for this survey do not represent those who have entered the labor force in scientific and engineering fields since 1970. In particular, this survey does not include the large numbers of graduates produced since 1970. This causes significant biases for such items as the relative distributions of sex, age, and race and the unemployment figures if the results are assumed to be indicative of the current scientific and engineering fields including new entrants since 1970.

Table B-2. Standard Errors of Percentages for Computer Specialists

(68 chances out of 100)

Base of percentage	1 or 99	2 or 98	5 or 95	10 or 90	15 or 85	25 or 75	50
100	6.4	9.1	14.1	19.4	23.1	28.0	32.4
200	4.6	6.4	10.0	13.7	16.3	19.8	22.9
500	2.9	4.1	6.3	8.7	10.3	12.5	14.5
700	2.4	3.4	5.3	7.3	8.7	10.6	12.2
1,000	2.0	2.9	4.5	6.1	7.3	8.9	10.2
2,500	1.3	1.8	2.8	3.9	4.6	5.6	6.5
5,000	.9	1.3	2.0	2.7	3.3	4.0	4.6
10,000	.6	.9	1.4	1.9	2.3	2.8	3.2
25,000	.4	.6	.9	1.2	1.5	1.8	2.0
50,000	.3	.4	.6	.9	1.0	1.3	1.4
75,000	.2	.3	.5	.7	.8	1.0	1.2
100,000	.2	.3	.4	.6	.7	.9	1.0

Appendix C. Questionnaire and Reference Lists

O.M.B. No. 99-S77003; Approval Expires December 31, 1978

FORM PMS-26D (9-26-77)

U.S. DEPARTMENT OF COMMERCE
BUREAU OF THE CENSUS

1978 NATIONAL SURVEY OF NATURAL AND SOCIAL SCIENTISTS AND ENGINEERS

NOTICE – Your report to the Census Bureau is confidential. It may be seen only by sworn Census employees and may be used only for statistical purposes.

Please read instructions carefully before answering questions.

Answer as accurately as you can by printing your reply clearly or by entering an "X" in the box next to the appropriate reply.

When the instructions for a question direct you to enter a code and description from a list, please refer to the reference list attached to this questionnaire.

PLEASE COMPLETE AND RETURN TO

Bureau of the Census
1201 East Tenth Street
Jeffersonville, Indiana 47132

A. Do you currently live in the State (or foreign country) printed in the above mailing label?

1 ☐ Yes, same State (or foreign country)

2 ☐ No, different State (or foreign country) – *Please enter your current State (or foreign country) of residence* _____ 3 ☐☐

FROM THE DIRECTOR
BUREAU OF THE CENSUS

This is the final questionnaire for the series of surveys known as the National Sample of Scientists and Engineers. The National Science Foundation, the project sponsor, and the Bureau of the Census wish to thank you for your invaluable contribution to this program. Each of the biennial surveys has given policymakers and planners an increasingly clearer view of the dynamics of the educational system and the job market for one of the Nation's central resources—highly trained persons. The goal of this final survey is to complete the picture for the decade of the 1970's.

Thus, we are asking you to provide one final report on your employment and related topics. The quesionnnaire is much shorter than previous ones. Please note that the sample includes many kinds of highly trained persons in addition to scientists and engineers. For the survey to be successful and yield truly representative information, it is important that each person fill out and return the questionnaire.

Please complete the questions which follow on pages 2 through 4 and return your questionnaire in the enclosed preaddressed envelope. For some questions you are instructed to enter a code and description from Reference List A, B, or C. These lists are attached to the questionnaire.

This information is being collected under the authority of the National Science Foundation Act of 1950, as amended. The information you provide is confidential and may be seen only by sworn employees of the Bureau of the Census. The information cannot be used for anything but statistical purposes and cannot be given to any other Government agency, private concern, or individual. The data will be released only in the form of statistical summaries from which it will be impossible to identify information about any particular person. Your response is entirely voluntary, and your failure to provide some or all of the requested information will in no way adversely affect you.

Thank you for your cooperation.

Sincerely,

Manuel D. Plotkin

MANUEL D. PLOTKIN

Enclosure

PART I – EDUCATION AND TRAINING

1. Since January 1972 have you attended any college, university, or other post high school institution?

1 ☐ Yes – *Continue with question 2a*
2 ☐ No – *Skip to question 4*

2a. What is the highest degree you have RECEIVED since January 1972?

Mark only one box

1 ☐ Associate
2 ☐ Registered Nurse (R.N.)
3 ☐ Bachelor's
4 ☐ Master's
5 ☐ First Professional Non-Medical (J.D., LL.B., Th.B.)
6 ☐ First Professional Medical (D.D.M., D.D.S., D.O., D.V.M., M.D.)
7 ☐ Doctorate
8 ☐ Other – *Specify* _____
9 ☐ None – *Skip to question 4*

b. When was this degree awarded?

If you received more than one degree at the same level (e.g., two master's degrees), enter the year of award of the most recent one.

19 ____

3. What was the major field of study of the degree you described in question 2?

Enter code and description from Reference List A.

Code ☐☐☐ Description from Reference List A _____

4 Aside from formal education, which of the following types of training did you receive in 1976 or 1977?

Mark the appropriate year for each type of training you have received.

	a. 1976	b. 1977
(1) On-the-job training	1 ☐	1 ☐
(2) Military training applicable to civilian occupations	2 ☐	2 ☐
(3) Extension or correspondence courses	3 ☐	3 ☐
(4) Courses at employer's training facility	4 ☐	4 ☐
(5) Courses at adult education center	5 ☐	5 ☐
(6) Other training	6 ☐	6 ☐
(7) None	7 ☐	7 ☐

PART II – EMPLOYMENT STATUS

5a. What was your employment status during the week of February 12–18, 1978?

1 ☐ Employed full time (including self-employed full time) – *Skip to 6a*
2 ☐ Employed part time (including self-employed part time) – *Answer 5b*
3 ☐ Unemployed and seeking work – *Go to Part III*
4 ☐ Not employed and not seeking work – *Skip to 7*

b. If you worked part time, were you seeking full-time work?

1 ☐ Yes
2 ☐ No

6a. Were you working in a position related to science or engineering during the week of February 12–18, 1978?

1 ☐ Yes – *Go to Part III*
2 ☐ No – *Answer 6b*

b. What was the most important reason for taking this position?

Mark only one box

1 ☐ Preferred nonscience or nonengineering position
2 ☐ Promoted out of science or engineering position
3 ☐ Pay was better in nonscience or nonengineering position
4 ☐ Locational preference
5 ☐ Science or engineering position not available
6 ☐ Other – *Specify* _____

(Go to Part III)

7. If you were not employed and not seeking work during the week of February 12–18, 1978, what was your most important reason for not seeking work?

Mark only one box

1 ☐ On vacation or otherwise temporarily absent from a job for health or personal reasons
2 ☐ On layoff from a job
3 ☐ Retired
4 ☐ Student
5 ☐ Tending to family responsibilities
6 ☐ Could not find work or believed no jobs available in my particular field
7 ☐ Other – *Specify* _____

(Go to Part III)

PART III – JOB ACTIVITIES

INSTRUCTIONS

a. Complete questions 8–15 for the job held during the week of February 12–18, 1978, or, if you did not hold a job during that week, complete these questions for your most recent job prior to that week.

b. If you held more than one job, please report only the job at which you worked the greatest number of hours.

Job held during the week of February 12–18, 1978, or most recent prior job.

8. Where did you work?

Write in city and State or foreign country of company, business, agency, or other employer.

City

☐☐ State or foreign country

9. What kind of business was this?

Enter code and description from Reference List B.

Code ☐☐☐ Description from Reference List B _____

10. What was your occupation?

Enter code and description from Reference List C.

Code ☐☐☐ Description from Reference List C _____

11a. What percent of working time did you devote to each of the following activities?

Entries should sum to 100%.

PLEASE NOTE

Basic research is study directed toward gaining scientific knowledge primarily for its own sake.

Applied research is study directed toward gaining scientific knowledge in an effort to meet a recognized need.

Development is direction of the knowledge gained from research toward production of useful materials, devices, systems, and methods.

01 _____ % Management or administration of research and development

02 _____ % Management or administration of other than research and development

03 _____ % Teaching and training – preparing and teaching courses, guiding and counseling students or trainees

04 _____ % Basic research

05 _____ % Applied research

06 _____ % Development – product, process, and technical development

07 _____ % Report and technical writing, editing, information retrieval

08 _____ % Clinical diagnosis

09 _____ % Design of equipment, processes, models

10 _____ % Quality control, testing, evaluation, or inspection

11 _____ % Operations – production, maintenance, construction, installation

12 _____ % Distribution – sales, traffic, purchasing, customer and public relations

13 _____ % Statistical work – survey work, forecasting, statistical analysis

14 _____ % Consulting

15 _____ % Computer applications

16 _____ % Other activities – *Specify* _____

TOTAL=100%

b. Among all these activities, which was your primary and which was your major secondary work activity?

Fill in the appropriate code numbers (01–16) from question 11a.

Code (01–16 from Question 11a).

☐☐ Primary work activity

☐☐ Secondary work activity

12. Which category best describes the type of organization of your principal employment or postdoctoral appointment?

Mark only one box

01 ☐ Business or industry, including self-employed

02 ☐ Junior college, 2-year college, technical institute

03 ☐ Medical school

04 ☐ 4-year college or university, other than medical school

05 ☐ Elementary or secondary school system

06 ☐ Hospital or clinic

07 ☐ Non-profit organization, other than hospital, clinic, or educational institution

08 ☐ U.S. military service, active duty, or Commissioned Corps, e.g., USPHS, NOAA

09 ☐ U.S. Government, civilian employee

10 ☐ State government

11 ☐ Local or other government – *Specify* _____

12 ☐ International agency

13 ☐ Other – *Specify* _____

PLEASE CONTINUE TO DESCRIBE THIS JOB ON PAGE 4 →

PART III – JOB ACTIVITIES – Continued

Job held during week of February 12–18, 1978, or most recent prior job

13. What was the basic salary associated with this position? (If not working during February 12–18, report ending salary of most recent prior job.)

If you were on a postdoctoral appointment, include stipend plus allowances. (Basic salary refers to salary before deductions for income tax, social security, retirement, etc. but does not include bonuses, overtime, summer teaching, or other payments for secondary jobs.)

a. $ _____ .00

b. 1 ☐ Per year
2 ☐ Per month
3 ☐ Per week

c. **If academically employed, mark whether salary is for –**
1 ☐ 9–10 months
2 ☐ 11–12 months

14. Between what dates did you hold this position? *Enter month and year*

Consider a change in positions to have occurred if there were significant changes in your duties, level of responsibility, or occupation, even if you continued to work for the same employer.

a. Beginning month and year: _____

b. Ending month and year: _____ OR ☐ Present

15a. Was ANY of your work supported or sponsored by U.S. Government funds?

1 ☐ Yes – *Continue with 15b*
2 ☐ No
3 ☐ Don't know } *Skip to 16a*

b. Which of the following agencies or departments were supporting the work? *Mark as many as apply*

01 ☐ AID (Agency for International Development)
02 ☐ Department of Agriculture
03 ☐ Department of Commerce
04 ☐ Department of Defense
05 ☐ Department of Energy
Department of Health, Education, and Welfare
06 ☐ Alcohol and Drug Abuse Mental Health Administration
07 ☐ NIH (National Institutes of Health)
08 ☐ Office of Education
09 ☐ Other HEW – *Specify* _____
10 ☐ Department of Housing and Urban Development
11 ☐ Department of the Interior
12 ☐ Department of Justice
13 ☐ Department of Labor
14 ☐ Department of Transportation
15 ☐ EPA (Environmental Protection Agency)
16 ☐ NASA (National Aeronautics and Space Administration)
17 ☐ NSF (National Science Foundation)
18 ☐ Nuclear Regulatory Commission
19 ☐ Other agency or department – *Specify* _____
20 ☐ Don't know source agency or department

PART IV – OTHER INFORMATION

16a. At anytime during calendar year 1977 were you without a job AND actively seeking employment?

1 ☐ Yes – *Continue with 16b*
2 ☐ No – *Skip to question 17*

b. For how many weeks were you seeking employment?

1 ☐ 1 to 4 weeks
2 ☐ 5 to 10 weeks
3 ☐ 11 to 14 weeks
4 ☐ 15 to 26 weeks
5 ☐ 27 weeks or more

17. How many years of professional experience, including teaching, have you had? *Enter number of years*

_____ Years

18. Based on your total education and experience, what do you regard yourself as professionally? *Enter code and description from Reference List C.*

Code ☐☐☐ Description from Reference List C _____

19. Listed at the right are selected topics of critical national interest. If you devote a significant proportion of your professional time to any of these problem areas, please mark the box for the one on which you spend the MOST time. *Mark only one box*

01 ☐ Health
02 ☐ Environment protection, pollution control
Education:
03 ☐ Teaching
04 ☐ Other
05 ☐ Space
06 ☐ National defense
07 ☐ Crime prevention and control
08 ☐ Food production and technology
09 ☐ Energy and fuel
10 ☐ Other mineral resources
11 ☐ Community development and services
12 ☐ Housing (planning, design, construction)
13 ☐ Other – *Specify* _____
14 ☐ Does not apply

20a. Are you physically handicapped?

1 ☐ Yes – *Continue with 20b*
2 ☐ No – *Skip to question 21*

b. What is the nature of your handicap(s)? *Mark as many as apply*

1 ☐ Visual
2 ☐ Auditory
3 ☐ Orthopedic
4 ☐ Other – *Specify* _____

21. Is your ethnic heritage Hispanic? (Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture)

1 ☐ Yes
2 ☐ No

22. In the event that it is necessary to contact you to clarify some of the information you provided, may we contact you by telephone?

☐ Yes – *Enter number(s) on which you can be reached* → Area code | Telephone number
☐ No Area code | Telephone number

23. Please print your name here | **Date prepared**

☆ U.S. GOVERNMENT PRINTING OFFICE 1977- 780-848

REFERENCE LIST A – MAJOR FIELDS OF STUDY

This list is to be used in answering question 3 about the field in which you have obtained study or training. It is divided into two sections: Section I is a list of fields of academic study generally leading to bachelor's or higher degrees. Section II is a list of fields of study and training below those generally leading to a bachelor's degree.

Please scan the entire list, choose the appropriate answer for the question and then enter the code and description in the appropriate section of question 3. If none of the categories listed below adequately describes what you were studying or being trained in, use the "Other" category (code 600 or 625) and enter a brief description of what you were studying in the space provided on the questionnaire.

Section I – FIELDS OF ACADEMIC STUDY LEADING TO BACHELOR'S OR HIGHER DEGREES

Code	Description
	Biological and Agricultural Sciences and Related Fields
501	Agriculture, business
502	Agriculture, general
503	Agronomy, field crops
504	Anatomy and histology
505	Animal physiology
506	Animal science
507	Bacteriology, virology, mycology, parasitology
508	Biochemistry
509	Biology, general
510	Biophysics
511	Botany, general
512	Dairy science (dairy husbandry)
513	Entomology
514	Farm management
515	Fish and game or wildlife management
516	Food science (food technology and processing, dairy manufacturing and technology, food industry)
517	Forestry
518	Genetics
519	Horticulture
520	Immunology
521	Microbiology
522	Plant pathology
523	Plant physiology
524	Soil science (soil management, soil conservation)
525	Zoology, general
526	Biological and agricultural sciences, other fields
	Education
527	Biological sciences education
528	Mathematics education
529	Physical sciences education
530	Trade and industrial training
531	Education, other fields
	Engineering
532	Aerospace, aeronautical, astronautical, and related fields
533	Agricultural
534	Architectural
535	Chemical, petroleum refining
536	Civil, construction, transportation
537	Electrical, electronics
538	Engineering sciences, mechanics, physics
539	Engineering technology
540	Environmental/sanitary engineering
541	General or unified
542	Industrial
543	Mechanical
544	Metallurgical, materials, ceramics
545	Mining, mineral, geological
546	Naval architecture and marine engineering
547	Nuclear
548	Operations research/systems engineering
549	Petroleum
550	Engineering, other fields
	Health Fields
551	Medicine or premedicine, and clinical medical sciences
552	Nursing (4 year or longer program)
553	Pathology
554	Pharmacology
555	Pharmacy
556	Health professions, other fields (4 year or longer program)
	Mathematical Sciences
557	Mathematics
558	Statistics and actuarial sciences
559	Computer sciences and systems analysis
560	Operations research/management science
	Physical Sciences
560	Astronomy
561	Chemistry
593	Geography
563	Meteorology
564	Physics
565	Physical sciences, general
566	Geology and geophysics
567	Oceanography
568	Physical sciences, other fields
	Psychology
569	Clinical
570	Educational
571	General psychology
572	Psychology, other fields
	Social Sciences
573	Anthropology
574	Area studies, regional studies
575	Economics, agricultural
576	Economics, except agricultural
577	Foreign service programs
593	Geography
579	History
580	Industrial relations
581	International relations
582	Political science or government
583	Public administration
584	Social sciences, general
585	Social work, social administration, social welfare
586	Sociology
587	Social sciences, other fields
	Arts, Humanities, and Other Specialties
588	Arts, general
589	Business and commerce, including accounting, hotel and restaurant administration, and secretarial studies
590	English and journalism
591	Fine and applied arts, all fields
592	Foreign language and literature, all fields
593	Geography
594	Home economics, all fields
595	Law or prelaw
596	Library science
597	Military science, including merchant marine deck officer
598	Philosophy, all fields
599	Religion and theology, all fields
600	Other *(Describe briefly under the applicable item on the questionnaire.)*

Section II – FIELDS OF ACADEMIC STUDY AND OCCUPATIONAL TRAINING RELATED TO PROGRAMS BELOW THE BACCALAUREATE

Code	Description
	Data Processing-related fields of study or training
601	Computer programming
602	Computer operating
603	All other data processing fields of study or training
	Engineering-related fields of study or training
604	Drafting and design, all fields
605	Aeronautical technology
606	Architectural or building technology
607	Chemical technology
608	Civil technology
609	Electrical and electronics technology
610	Industrial technology
611	Mechanical technology
612	All other engineering-related fields of study or training
	Science-related fields of study or training
613	Agriculture
614	Forestry
615	Other science-related fields of study or training
	Other fields of study or training
616	Business and commerce-related fields of study or training
617	Craft (skilled) occupations-related fields of study or training (such as carpentry, bricklaying, tool and die making, etc.)
618	Educational-related fields of study or training
619	Home economics
620	Nursing and other health service-related fields of study or training
621	Operative occupations-related fields of study or training (such as machine operation, driving, inspecting, etc.)
622	Police technology or law enforcement
623	Sales and marketing-related fields of study or training
624	Service occupations-related fields of study or training (such as cook, beautician, firefighter, etc.)
625	All other fields of study or training *(Describe briefly under the applicable item on the questionnaire.)*

PLEASE DETACH BEFORE RETURNING YOUR COMPLETED QUESTIONNAIRE

REFERENCE LIST B – KINDS OF BUSINESSES

This list is to be used in answering question 9 about the kind of business or industry for which you worked. Please scan the entire list, choose the appropriate answer for the question and enter the code and description from this list. If none of the categories listed below adequately describes the kind of business for which you worked, use the "Other" category (code 731).

Code	Description
	Manufacturing
701	Aircraft, aircraft engines, aircraft parts
702	Chemicals and allied products
703	Electrical machinery, equipment and supplies for the generation, storage, transformation, transmission, and utilization of electrical energy
704	Electronic apparatus, radio, television and communication equipment and parts
705	Electronic computers, accounting, calculating and office machinery and equipment
706	Fabricated metal products (except ordnance, machinery and transportation equipment)
707	Machinery (except electrical) including engines and turbines, farming and construction machinery, mining, metalworking and other manufacturing and service industry machines
708	Motor vehicles and motor vehicle equipment including trucks, buses, automobiles, railroad engines and cars
709	Ordnance, including manufacture of arms, ammunition, tanks, and complete guided missiles, space vehicles and equipment
710	Petroleum refining and related industries
711	Primary metal industries, including smelting, refining, rolling, drawing, alloying, and manufacture of castings, forgings and other basic metal products
712	Professional and scientific equipment and supplies
713	Other manufacturing including printing and publishing
	Educational Institutions
714	College or university (offering at least a bachelor's degree)
715	Junior college or technical institute
716	Medical school
717	Other educational institutions
	Health Services
718	Hospital or clinic
719	Other medical and health services

Code	Description
	Other Kinds of Business
720	Agriculture, forestry, and fisheries
721	Business, personal, and professional services
722	Construction
723	Engineering or architectural services
724	Finance, insurance, or real estate
725	Mining and petroleum extraction
726	Private, nonprofit organizations other than educational institutions and hospitals
727	Professional and technical societies
728	Research institutions
729	Retail and wholesale trade
730	Transportation, communication, or other public utilities
731	Other *(Describe briefly under the applicable item on the questionnaire.)*
	Public Administration (Include only uniquely governmental activities, such as the U.S. Postal Service, U.S. Air Force, State court, Department of Motor Vehicles, city building inspection, or city public welfare. For example, if you work for the U.S. Postal Service use code 733, Federal public administration; on the other hand, if you work at a Veterans' Administration Hospital, use code 718, Hospital or clinic; if you work at a State university, use code 714, College or university; if you work for a county road building agency, use code 722, Construction; if you work in a Defense Department research laboratory, use code 728, Research institution.)
732	Uniformed military service
733	Federal public administration
734	State public administration
735	Local public administration (city, county, etc.)
737	Regional government
736	Other government

REFERENCE LIST C – OCCUPATIONS

This list is to be used in answering questions 10 and 18 about your occupational classification. Please scan the entire list, choose the appropriate entry and enter the code and description from this list. If you cannot find exactly the right entry, please choose the one that comes nearest to it. If none of the entries is at all appropriate, use the "Other" category (code 475) and enter a brief description in the space provided on the questionnaire.

Code	Description
	Engineers, including college professors and instructors
401	Engineer, aeronautical and astronautical
402	Engineer, agricultural
403	Engineer, chemical
404	Engineer, civil and architectural
405	Engineer, electrical and electronic
406	Engineer, industrial
407	Engineer, mechanical
408	Engineer, metallurgical and materials
409	Engineer, mining, petroleum, and geological
410	Engineer, nuclear
411	Engineer, environmental and sanitary
412	Engineer, operations research systems
413	Engineer, other fields *(Describe briefly under the applicable item on the questionnaire.)*
	Computer Specialist, including college professors and instructors
414	Computer programmer
415	Computer systems analyst
416	Computer scientist
417	Other computer specialist *(Describe briefly under the applicable item on the questionnaire.)*
	Mathematicians and Statisticians, including college professors and instructors
418	Actuary
419	Mathematician
420	Statistician
421	Operations research analyst
	Physical Scientists, including college professors and instructors
422	Chemist
423	Earth scientists including geologists, geophysicists, etc.
424	Physicist, astronomer
425	Atmospheric scientist, meteorologist
426	Oceanographer
427	Other physical scientist *(Describe)*
	Biological Scientists, including college professors and instructors
428	Agricultural scientists, including foresters and conservationists
429	Biological scientist
430	Biochemist
431	Biophysicist
432	Medical scientist, excluding persons who are primarily medical practitioners; see Health Occupations
433	Other biological scientist *(Describe)*
	Social scientists, including college professors and instructors
434	Economist
435	Psychologist
436	Sociologist or anthropologist
437	Other social scientist *(Describe briefly under the applicable item on the questionnaire.)*

Code	Description
	Health Occupations, including persons who are primarily practitioners. Persons engaged primarily in medical research, teaching, and similar activities use code 432, Medical scientist.
438	Physician or surgeon
439	Technician, dental
440	Technician, medical
441	Other health occupation *(Describe briefly under the applicable item on the questionnaire.)*
	Technicians and Technologists, except medical
442	Designer, electronic parts and machine tools
443	Designer, industrial
444	Designer, other
445	Draftsman
446	Surveyor
447	Technician, biological and agricultural
448	Technician, electrical and electronic
449	Technician, construction, highways, and architectural
450	Technician, mechanical
451	Technician, other engineering
452	Technician, physical science
453	Technician, other fields *(Describe briefly under the applicable item on the questionnaire.)*
	Teachers
454	Teacher, elementary school
455	Teacher, secondary school
456	Teacher, college and university, **excluding engineering and science** *(Engineering and science teachers see codes 401–437 above.)*
	Administrators, Managers, and Officials, excluding farm
476	Urban and regional planner
457	College president or dean
458	Administrator or manager, scientific and technical research and development
459	Administrator or manager, production and operations
460	Administrator, manager, or official, all other, excluding self-employed
461	Self-employed proprietor
	All Other Occupations
462	Accountant
463	Attorney or judge
464	Sales worker
465	Clerical worker (such as bookkeeper, secretary, etc.)
466	Clergy
467	Craft worker (such as baker, carpenter, electrician, mechanic, repair worker)
468	Farmer (owner, manager, tenant, or farm laborer)
469	Fire fighter or police
470	Laborer, except farm
471	Librarian
472	Merchant or shopkeeper, self-employed
473	Operative (such as assembler, factory worker, miner, welder, truck driver, etc.)
474	Postal worker
475	Other occupations, not specified above *(Describe briefly under the applicable item on the questionnaire.)*

Appendix D. Source of Data

Characteristic	Table number	Item number on 1978 questionnaire
Age in 1978*	1	(From the 1970 census response)
Sex	1	(From the 1972 survey response, if available; otherwise from the 1970 census response)
Race*	1	(From the 1970 census response)
Residence in 1978	1	A, page 1
Professional identification	1	Part IV, 18
Hispanic heritage	1	Part IV, 21
Occupation in 1978	1	Part III, 10
Highest degree held*	2	2a; otherwise from 1976, 1974, or 1972 survey response
Major field of study for highest degree held*	2	3; otherwise from 1976, 1974, or 1972 survey response
Type of supplementary training: 1977	2	Part I, 4b
Job and occupational mobility: 1976, 1978*	3	1976 survey response and Part III, 10, 14
Job and occupational mobility: 1974, 1978*	3	1974 survey response and Part III, 10, 14
Job and occupational mobility: 1972, 1978*	3	1972 survey response and Part III, 10, 14
Years of professional experience*	3	Part IV, 17
Type of employer	4	Part III, 12
Federal support	4	Part III, 15a, 15b
Unemployment status: 1977	4	Part IV, 16a, 16b
Employment status: February 1978*	4	Part II, 5a, 5b, 7
Full-time employment in science or engineering: February 1978	4	Part II, 6a, 6b
National interest topics	4	Part IV, 19
Industry in 1978	4	Part III, 9
Primary work activity*	4	Part III, 11b
Annual salary rate: 1978	5	Part III, 13

*For more information, see appropriate subject in appendix A.

Appendix E. Response Rates

Table E-1 presents response rates of various components of the sample for the 1978 National Survey of Natural and Social Scientists and Engineers. The characteristics presented here are based on the 1970 census or on the 1978, 1976, 1974, or 1972 surveys. Since the percentages in table E-1 are based on a complete count of the sample cases, no reference to the standard error tables is necessary.

Table E-2 presents distributions of respondents and nonrespondents by the set of characteristics shown in table E-1.

Table E-1 is the counterpart of table E-1 of appendix E of the first report in this series *Selected Characteristics of Persons in Physical Science: 1978.* Table E-1 of that report, however, contained data for 362 respondents whose data were not represented in the tables and text of the report. Table E-1 of this report for social scientists and psychologists excludes data for these 362 respondents.

Table F-1. National Sample, by Field of Science or Engineering in 1976, 1974, and 1972, Age in 1978, and Sex, by Response in the 1978 Survey (Unweighted)

Sex, age in 1978 and field of science or engineering 1976	Response in 1978			
	Total		Respondents	Nonrespondents
	Number	Percent		
Total	50,093	100.0	81.4	18.6
SEX				
Male	46,877	100.0	81.6	18.4
Female	3,216	100.0	78.5	21.5
AGE IN 1978				
Under 30 years	287	100.0	76.0	24.0
30 to 34 years	6,264	100.0	75.7	24.3
35 to 39 years	9,226	100.0	78.1	21.9
40 to 44 years	8,075	100.0	81.3	18.7
45 to 49 years	7,644	100.0	83.1	16.9
50 to 54 years	6,994	100.0	84.9	15.1
55 to 59 years	5,183	100.0	85.8	14.2
60 to 64 years	3,193	100.0	85.5	14.5
65 to 69 years	1,930	100.0	82.2	17.8
70 years and over	1,297	100.0	76.2	23.8
FIELD OF SCIENCE OR ENGINEERING IN 1976				
Respondents in 1976	42,644	100.0	91.8	8.2
Total in scope in 1976	37,602	100.0	92.0	8.0
Computer specialists	2,064	100.0	90.8	9.2
Engineers	19,922	100.0	91.4	8.6
Mathematical specialists	1,486	100.0	92.6	7.4
Life scientists	3,800	100.0	93.9	6.1
Physical scientists	4,695	100.0	93.4	6.6
Environmental scientists	1,749	100.0	92.3	7.7
Psychologists	1,936	100.0	92.1	7.9
Social scientists	1,950	100.0	92.4	7.6
Total out-of-scope in 1976	5,042	100.0	89.8	10.2
Nonrespondents in 1976	7,449	100.0	21.9	78.1
FIELD OF SCIENCE OR ENGINEERING IN 1974				
Respondents in 1974	44,158	100.0	88.9	11.1
Total in scope in 1974	39,473	100.0	89.2	10.8
Computer specialists	2,291	100.0	87.4	12.6
Engineers	20,814	100.0	88.6	11.4
Mathematical specialists	1,612	100.0	89.3	10.7
Life scientists	4,026	100.0	91.0	9.0
Physical scientists	4,824	100.0	91.3	8.7
Environmental scientists	1,867	100.0	88.6	11.4
Psychologists	1 989	100.0	89.0	11.0
Social scientists	2,050	100.0	89.2	10.8
Total out-of-scope in 1974	4,685	100.0	86.2	13.8
Nonrespondents in 1974	5,935	100.0	25.6	74.4
FIELD OF SCIENCE OR ENGINEERING IN 1972				
Respondents in 1972	50,093	100.0	81.4	18.6
Total in scope in 1972	50,093	100.0	81.4	18.6
Computer specialists	3,391	100.0	76.7	23.3
Engineers	25,797	100.0	81.1	18.9
Mathematical specialists	2,185	100.0	81.9	18.1
Life scientists	4,891	100.0	84.1	15.9
Physical scientists	6,248	100.0	84.0	16.0
Environmental scientists	2,095	100.0	82.2	17.8
Psychologists	2,488	100.0	79.9	20.1
Social scientists	2,998	100.0	79.4	20.6

Table E-2. Respondents and Nonrespondents in the 1978 National Survey, by Field of Science or Engineering in 1976, 1974, and 1972, by Age in 1978, and Sex (Unweighted)

Sex, age in 1978, and field of science or engineering in 1976, 1974, 1972	Responded in 1978		Did not respond in 1978	
	Number	Percent	Number	Percent
Total	40,771	100.0	9,322	100.0
SEX				
Male	38,245	93.8	8,632	92.6
Female	2,526	6.2	690	7.4
AGE IN 1978				
Under 30 years	228	0.5	69	0.7
30 to 34 years	4,739	11.6	1,525	16.4
35 to 39 years	7,208	17.7	2,018	21.6
40 to 44 years	6,565	16.1	1,510	16.2
45 to 49 years	6,354	15.6	1,290	13.8
50 to 54 years	5,939	14.6	1,055	11.3
55 to 59 years	4,445	10.9	738	7.9
60 to 64 years	2,729	6.7	464	5.0
65 to 69 years	1,586	3.9	344	3.7
70 years and over	988	2.4	309	3.3
Median age	45	(X)	43	(X)
FIELD OF SCIENCE OR ENGINEERING IN 1976				
Responded in 1976	39,137	96.0	3,507	37.6
In scope in 1976	34,609	84.9	2,993	32.1
Computer specialists	1,875	4.6	189	2.0
Engineers	18,206	44.7	1,716	18.4
Mathematical specialists	1,376	3.4	110	1.2
Mathematicians	992	2.4	89	1.0
Statisticians	384	0.9	21	0.2
Life scientists	3,568	8.8	232	2.5
Agricultural scientists	1,446	3.5	94	1.0
Biologists	1,720	4.2	112	1.2
Medical scientists	402	1.0	26	0.3
Physical scientists	4,384	10.8	311	3.3
Chemists	2,692	6.6	171	1.8
Physicists and astronomers	1,443	3.5	124	1.3
Other physical scientists	249	0.6	16	0.2
Environmental scientists	1,615	4.0	134	1.4
Earth scientists	1,357	3.3	114	1.2
Atmospheric scientists	187	0.5	13	0.1
Oceanographers	71	0.2	7	0.1
Psychologists	1,784	4.4	152	1.6
Social scientists	1,801	4.4	149	1.6
Economists	750	1.8	70	0.8
Sociologists and anthropologists	484	1.2	38	0.4
Other social scientists	567	1.4	41	0.4
Out of scope	4,528	11.1	514	5.5
Did not respond in 1976	1,634	4.0	5,815	62.4

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